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0821 U.S. PRO**UTILITY PATENT APPLICATION TRANSMITTAL
(Small Entity)**

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.
1843-A-DIV-CIP-DIVTotal Pages in this Submission
3**TO THE ASSISTANT COMMISSIONER FOR PATENTS**Box Patent Application
Washington, D.C. 20231

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application invention entitled:

METHOD AND APPARATUS FOR REMOVING METAL COMPOUNDS FROM WASTE MATERIAL

and invented by:

Sanford M. Stevenson

If a **CONTINUATION APPLICATION**, check appropriate box and supply the requisite information:☐ Continuation ☒ Divisional ☐ Continuation-in-part (CIP) of prior application No.: 09/268,465

Which is a:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.:

Which is a:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.:

Enclosed are:

Application Elements

1. ☒ Filing fee as calculated and transmitted as described below
2. ☒ Specification having 11 pages and including the following:
 - a. ☒ Descriptive Title of the Invention
 - b. ☒ Cross References to Related Applications (if applicable)
 - c. ☐ Statement Regarding Federally-sponsored Research/Development (if applicable)
 - d. ☐ Reference to Microfiche Appendix (if applicable)
 - e. ☒ Background of the Invention
 - f. ☒ Brief Summary of the Invention
 - g. ☒ Brief Description of the Drawings (if drawings filed)
 - h. ☒ Detailed Description
 - i. ☒ Claim(s) as Classified Below
 - j. ☒ Abstract of the Disclosure

0821 U.S. PRO
09/652272
08/31/00

UTILITY PATENT APPLICATION TRANSMITTAL
(Small Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.
1843-A-DIV-CIP-DIV

Total Pages in this Submission
3

Application Elements (Continued)

3. ☒ Drawing(s) *(when necessary as prescribed by 35 USC 113)*
- a. ☒ Formal b. ☐ Informal Number of Sheets 2
4. ☒ Oath or Declaration
- a. ☐ Newly executed *(original or copy)* ☐ Unexecuted
- b. ☒ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional application only)*
- c. ☒ With Power of Attorney ☐ Without Power of Attorney
- d. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application,
see 37 C.F.R. 1.63(d)(2) and 1.33(b).
5. ☐ Incorporation By Reference *(usable if Box 4b is checked)*
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under
Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby
incorporated by reference therein.
6. ☐ Computer Program in Microfiche
7. ☐ Genetic Sequence Submission *(if applicable, all must be included)*
- a. ☐ Paper Copy
- b. ☐ Computer Readable Copy
- c. ☐ Statement Verifying Identical Paper and Computer Readable Copy

Accompanying Application Parts

8. ☐ Assignment Papers *(cover sheet & documents)*
9. ☐ 37 CFR 3.73(b) Statement *(when there is an assignee)*
10. ☐ English Translation Document *(if applicable)*
11. ☐ Information Disclosure Statement/PTO-1449 ☐ Copies of IDS Citations
12. ☒ Preliminary Amendment
13. ☒ Acknowledgment postcard
14. ☒ Certificate of Mailing
- ☐ First Class ☒ Express Mail *(Specify Label No.):* EL550116169US

UTILITY PATENT APPLICATION TRANSMITTAL (Small Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.
1843-A-DIV-CIP-DIV

Total Pages in this Submission
3

Accompanying Application Parts (Continued)

15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
16. ☒ Small Entity Statement(s) - Specify Number of Statements Submitted: 1
17. ☐ Additional Enclosures (please identify below):

Fee Calculation and Transmittal

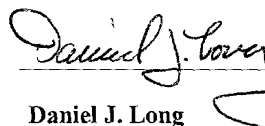
CLAIMS AS FILED

| For | #Filed | #Allowed | #Extra | Rate | Fee |
|--|--------|----------|--------|-----------|----------|
| Total Claims | 26 | - 20 = | 6 | x \$9.00 | \$54.00 |
| Indep. Claims | 2 | - 3 = | 0 | x \$39.00 | \$0.00 |
| Multiple Dependent Claims (check if applicable) <input type="checkbox"/> | | | | | \$0.00 |
| BASIC FEE | | | | | \$345.00 |
| OTHER FEE (specify purpose) | | | | | \$0.00 |
| TOTAL FILING FEE | | | | | \$399.00 |

- ☒ A check in the amount of \$399.00 to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge and credit Deposit Account No. 19-0083 as described below. A duplicate copy of this sheet is enclosed.
- ☐ Charge the amount of as filing fee.
- ☒ Credit any overpayment.
- ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
- ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Dated:

8/31/00


Signature

Daniel J. Long
Reg. No. 29,404
Sand & Sebolt
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Canton, OH 44718
330-492-1925

cc:

| | | | |
|--|--|---|--|
| CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10) Applicant(s): Sanford M. Stevenson | | Docket No. 1843-A-DIV-CIP-DIV | |
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|------------------------------|--------------------------------|----------|----------------|
| Serial No. Unknown | Filing Date Herewith | Examiner | Group Art Unit |
|------------------------------|--------------------------------|----------|----------------|

Invention: **METHOD AND APPARATUS FOR REMOVING METAL COMPOUNDS FROM WASTE MATERIAL**

I hereby certify that the following correspondence:

Patent application, Declaration and Power of Attorney, Small Entity Statement

(Identify type of correspondence)

is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 in an envelope addressed to: The Assistant Commissioner for Patents, Washington, D.C. 20231 on

8/31/00

(Date)

Tiffany M. Godfrey

(Typed or Printed Name of Person Mailing Correspondence)

(Signature of Person Mailing Correspondence)

EL550116169US

("Express Mail" Mailing Label Number)

Note: Each paper must have its own certificate of mailing.

Applicant or Patentee: Sanford M. Stevenson Serial or Patent No.: 09/268465
Docket No. 60014-14 Filed or Issued: March 16, 1999
Entitled: METHOD AND APPARATUS FOR REMOVING METAL COMPOUNDS FROM WASTE MATERIAL

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) AND 1.27(b) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.19(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled: METHOD AND APPARATUS FOR REMOVING METAL COMPOUNDS FROM WASTE MATERIAL

described in

- ☐ the specification filed herewith
☒ application serial no. 09/268465, filed March 16, 1999
☐ patent no. _____, issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. 1.9(d) or a non-profit organization under 37 C.F.R. 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

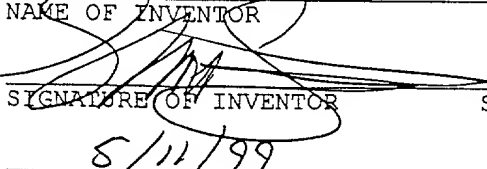
- ☒ no such person, concern, or organization
☐ persons, concerns or organizations listed below*

*Note: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities.
(37 C.F.R. 1.27)

FULL NAME Chemical Separation Technology, Inc.
ADDRESS 2106 Washington Road, Canonsburg, PA 15317
☒ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NON-PROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 C.F.R. 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Sanford M. Stevenson
NAME OF INVENTOR NAME OF INVENTOR NAME OF INVENTOR

SIGNATURE OF INVENTOR SIGNATURE OF INVENTOR SIGNATURE OF INVENTOR
5/11/99
DATE DATE DATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Sanford M. Stevenson

Serial No: Unknown

Examiner: Unknown

Filed: Herewith

Art Unit: Unknown

For: METHOD AND APPARATUS FOR REMOVING METAL COMPOUNDS FROM
WASTE MATERIAL

Assistant Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Please amend the above captioned application before examination as follows.

In the title:

Delete "MATERIAL" and substitute - -WATER- -.

In the claims:

Please Cancel claims 2-6.

Please add the following new claims 7-31.

7. A method for removing metal compounds comprising copper metal compounds from waste water comprising the steps of:

(a) adjusting the pH of the waste water to from about 5 to about 12;

(b) aerating the waste water;

(c) agitating the waste water, where steps (a), (b) and (c) are carried out simultaneously in a reaction tank and waste water is aerated in said reaction tank to provide a dissolved oxygen concentration at from about 0.01 lb./hr. to about 70 lbs./hr. at a waste

water input flow rate of from about 50 gal./min. to about 500 gal./min. for a metals concentration of from about 50 mg./L to about 1,000 mg./L;

(d) then adding a flocculating agent polymer selected from a group consisting of cationic and anionic polymers to the water and allowing floccules including said metal compounds to form; and

(e) then separating said floccules including said metal compounds from the water.

8. The method of claim 7 wherein there is added the further step (f) of further dewatering the floccules separated in step (e).

9. The method of claim 8 wherein additional flocculating agent polymer is added to at least a portion of the waste water containing the flocculated metal compound separated in step (e).

10. The method of claim 9 wherein after the addition of the additional flocculating agent polymer, the flocculated metal compound is dewatered in step (f) in a belt of filter press.

11. The method of claim 10 wherein there is water which is removed in step (f) and said water removed in step (f) is removed to a polishing pond.

12. The method of claim 8 wherein in step (e) separation is conducted by means of a clarifier.

13. The method of claim 12 wherein additional flocculating agent is added to at least a portion of the flocculated metal compound separated in step (e).

14. The method of claim 13 wherein after the addition of the additional flocculating agent polymer, the flocculated metal compound is dewatered in step (f) in a belt filter press.

15. The method of claim 14 wherein there is water removed in step (f) and said water removed in step (f) is removed to a polishing means.

16. The method of claim 8 wherein in step (e) separation is conducted by means of sequential treatment in a clarifier and a rotary drum thickener.

17. The method of claim 16 wherein additional flocculating agent polymer is added after the clarifier and then again after the rotary drum thickener.

18. The method of claim 17 wherein after the additional flocculating agent polymer, the flocculated metal compound is dewatered in step (f) in a belt filter press.

19. The method of claim 18 wherein there is water removed in step (f) and said water removed in step (f) is removed to a polishing pond.

20. The method of claim 17 wherein water removed in step (f) is removed to a settling pond.

21. The method of claim 8 wherein in step (e) separation is conducted by means of a settling pond.

22. The method of claim 21 wherein additional flocculating agent is added after the settling pond.

23. The method of claim 22 wherein after the additional polymer is added the flocculated metal compound is dewatered in step (f) in a belt filter press.

24. The method of claim 7 wherein in step (a) the pH is adjusted to from about 6 to about 9.

25. The method of claim 7 wherein in step (a) the pH is adjusted by adding a neutralizing agent selected from sodium hydroxide, anhydrous ammonia, sulfuric acid and hydrochloric acid.

26. The method of claim 7 wherein the polymer is a cationic polymer which is used for dewatering purposes.

27. The method of claim 7 wherein the polymer is an anionic polymer which is used for primary clarification purposes.

28. The method of claim 7 wherein the polymer is an anionic polymer which is used for settling purposes.

29. The method of claim 7 wherein the polymer is added in a dilute concentration of from about 0.5% to about 1.5% by weight.

30. The method of claim 7 wherein after step (e) a portion of the separated water is removed to a polishing pond.

31. The method of claim 7 wherein in step (e) separation is conducted by means of a rotary drum thickener.

Respectfully submitted at Canton, Ohio this 31st day of Aug., 2000.

SAND & SEBOLT



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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as express mail in an envelope addressed to
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on this 31 day of August, 2000.



Tiffany Godfrey

METHOD AND APPARATUS FOR REMOVING METAL COMPOUNDS
FROM WASTE MATERIAL

Cross Reference to Related Applications

5 This is a continuation-in-part of copending application
Serial No. 08/714,510, filed April 4, 1995, which is a
continuation of application Serial No. 08/348,581, filed
December 2, 1994, which is a division of application Serial No. .
08/072,412, filed May 25, 1993, now U.S. Patent No. 5,370,800.

10 Background of the Invention

The present invention relates to the treatment of waste
water, and, in particular, to the treatment of water to remove
various precipitated or suspended metal compounds therefrom.

15 Runoffs from a number of industrial operations such as
electrical power plants, steel plants and mines are known to be
contaminated with various metal compounds including iron,
manganese, aluminum, zinc, copper, lead, arsenic and chromium.
Such contaminants may pose a serious environmental problem.

20 Methods heretofore used to remove such contaminants have
included the additional lime, soda ash or other neutralizing
agents and the use of holding ponds or clarifying tanks. Such
methods have not, however, been entirely satisfactory because of

the lengthy periods of time, which they would generally be required to effect treatment.

Summary of the Invention

5 It is therefore an object of the present invention to provide an improved method and apparatus for removing precipitate or suspended metal compounds from waste water.

10 In this method, the pH of the water is first adjusted from 6 to 10. Preferred neutralizing agents are sodium hydroxide, and anhydrous ammonia when the waste water is overly acidic or sulfuric acid or hydrochloride acid when it is overly basic.

15 The water is also aerated to a dissolved oxygen concentration of from .01 lb./hr to 70 lb./hr. Neutralization and aeration may preferably be done simultaneously. A polymeric flocculating agent is then added to the water. The metal compounds are then flocculated, and the flocculated metal compounds are separated from the water by means of a rotary drum thickener clarifier or other suitable means. A preferred flocculating agent is an anionic or cationic polymer wherein the use of an anionic
20 polymer would be preferred for primary clarification or settling purposes while the cationic polymer would be preferred for dewatering purposes. The flocculated metal compounds are then

further dewatered in a belt filter press or other suitable apparatus.

Brief Description of the Drawings

The present invention is further described with reference
5 to the accompanying drawing in which:

Figure 1 is a schematic drawing of apparatus used to carry out one preferred embodiment of the method of the present invention;

10 Figure 2 is a schematic drawing of apparatus used to carry out another preferred embodiment of the method of the present invention;

Figure 3 is a schematic drawing of apparatus used to carry out a third preferred embodiment of the method of the present invention; and

15 Figure 4 is a schematic drawing of apparatus used to carry out a fourth preferred embodiment of the method of the present invention.

Detailed Description

20 Referring to Figure 1, the raw water source is shown at numeral 10. Waste water is removed from this source in line 12. Neutralizing agent tank 14 is connected by line 16 to reaction neutralizing agent, aerated and agitated. A preferred

embodiment of the reaction tank 18 is described in U.S. Patent No. 4,749,497, although it has now been found that in some cases, the apparatus disclosed in that patent may be advantageously modified by the removal of its baffles and the relocation of the aeration mixing unit to a 45° angle to the vertical plane of the reaction tank. The rate of aeration would normally be from about .10 lbs./hr to about 70 lbs./hr for a metals concentration of 50 mg/l to 1,000 mg/l at a raw water input flow rate of 50 gal/min to 500 gal/min. The pH of the water is adjusted to between 5 and 12 and preferably to between 6 and 9. It will be understood that for regulatory reasons, if the pH is adjusted to above 9, it will ordinarily be necessary to reduce the pH to below that level on completion of the process described herein. The water is then removed in line 20 to rotary drum thickener 22. A flocculating agent from polymer tank 24 is also moved in line 26 to line 20 to be mixed with the water in rotary drum thickener 22 where the metal compounds are flocculated and separated. Such polymers, which are used for primary clarification purposes are anionic polymers. NALCO 7767 is a suitable commercially available anionic polymer. Cationic polymers may be used for dewatering purposes and may be selected from the following commercially available polymers: PERCOL AC 737 and UNIFLOC 630. Water from the rotary drum thickener is

removed in line 28 to polishing pond 30 from where outfall is removed in line 32. Water and flocculated metal compounds are removed from the rotary drum thickener in line 34. Additional polymer from polymer tank 36 is moved in line 38 to be mixed
5 with water and flocculated metal compound in line 38, which are then moved to belt filter press 40 where the flocculants are dewatered and from which water is removed to the polishing pond in line 42. An equivalent thickening means such as a gravity belt filter or a vacuum belt filter may be substituted for the
10 rotary drum thickener. An equivalent water removal means such as a screw press or a plane and frame press may be substituted for the belt filter press. Other equivalent polishing means may be substituted for the polishing pond. Such equivalent
15 polishing means would include a settling clarifier, which would have a rake to move suspended solids, a settling tank, or a filter that could be a ceramic filter, a DACRON filter, a fiberglass filter, a sand filter or a micro-filter.

Referring to Figure 2, waste water from a raw water source
110 is removed in line 112 to be mixed with neutralizing agent
20 from tank 114 moved in line 116 to reaction tank 118. The neutralized, aerated and agitated water is then removed in line 120 to clarifier 122 to which flocculating agent from polymer tank 124 through line 126 is mixed. Water is removed from the

clarifier in line 128 to polishing pond 130 from where outfall
is released from line 132. Flocculated metal compound along
with water is removed from the clarifier in line 134 from where
it is mixed with additional polymer from polymer tank 136 and
5 line 138 and then dewatered in belt filter press 140 where
additional water is removed and transported to the polishing
pond in line 142.

Referring to Figure 3, waste water from raw water source
210 is removed in line 212 and neutralizing agent from tank 214
10 is removed in line 216 to reaction tank 218 from where it is
removed in line 220 to clarifier 222 after being mixed with
flocculating agent from polymer tank 224 moved through line 226.
Water from the clarifier is removed in line 228 to polishing
pond 230 from where outfall is removed in line 232. Floccules
15 containing metal compounds are removed with water from the
clarifier in line 234. Additional polymer from polymer tank 236
is removed in line 238 to be mixed with the floccules which are
then introduced to rotary drum thickener 239 and are then
introduced to belt filter press 240 after being mixed with
20 additional polymer from tank 241 which is removed in line 243
and mixed with water from the rotary drum thickener removed
through line 245. Water from the belt filter press is removed

in line 242 and transformed with water from line 244 from rotary drum thickener 239 to the polishing pond.

Referring to Figure 4, waster water from waste water source 310 is removed in line 312 and mixed with neutralizing agent
5 from tank 314 and line 316 in reaction tank 318 from where water is removed in line 320 to settling pond 322. Flocculating agent is introduced from polymer tank 324 through line 326. Water is removed from the settling pond in line 328 to polishing pond 330 from where outflow is removed in line 332. Floccules containing
10 metal compound along with water are removed in line 334 and are mixed with additional polymer from tank 336 and introduced through line 338 and then dewatered in belt filter press 340 from which water is removed to the polishing tank in line 342. Alternatively, portions of the floccules, water and polymer
15 mixture in line 334 are also diverted to borehole 344 and drying bed 346.

The method and apparatus of the present invention is further described with reference to the following example.

20

Example

350 GPM of waste water having a pH of 2, having dissolved metal concentrations of 10,000 ppm was first pumped from a collection area to a reaction vessel where is was aerated and

agitated at a dissolved oxygen concentration of 3 lb./HP hour. Sodium hydroxide was added automatically as the neutralizing agent, at juxtaposition to the waste water, aeration and agitation point, to an adjusted pH of 8.5. The neutralized waste water is transferred to a flocculator reactor where a UNIFLOC 630 cationic polymer is added at a rate of 2 GPM. The instantaneous agglomeration of the neutralized waste water was transferred to a rotary drum thickener where water was filtered from the metal hydroxide sludge, where supernate water was removed to a polishing pond at a rate of approximately 300 GPM. Metal hydroxide sludge was removed from the rotary drum thickener at a rate of approximately 50 GPM to a felt filter press where a cationic polymer was added at a rate of 1 GPM. After processing through the belt filter, press cake solids were recovered at a 15% to 40% dry solids. Water leaving the polishing pond consistently had a metal ion concentration below EPA permitted limits.

Although the invention has been described with a certain degree of particularity, it is to be understood that the present disclosure has been made only as an example and that the scope of the invention is defined by what is claimed hereafter.

WHAT IS CLAIMED IS:

1. (Amended) An apparatus for removing metal compounds from waste water comprising:

(a) means for simultaneously adjusting the pH of the waste water, aerating the waste water and agitating the waste water all integrated into a single reaction tank;

(b) means outputting water from element (a) and for adding a polymeric flocculating agent to the water outputted from element (a);

(c) thickener means connected to element (b) for separating water from floccules and water including metal compounds; and

(d) means for outputting supernate water, and water and floccules including metal compounds from element (c) and for the adding of a polymeric flocculating agent to said water and floccules including metal compounds outputted from element (c);

(e) means for removing additional water from said floccules;

(f) means for transporting said additional water from element (e) and said supernate water from element (c) to a polishing means; and

(g) means for removing water form said polishing means.

2. The apparatus of claim 1 wherein the thickener means is a rotary thickener means.

3. The apparatus of claim 2 wherein the thickener means is a rotary drum thickener.

4. The apparatus of claim 1 wherein the means for removing additional water from the floccules is a press means.

5. The apparatus of claim 4 wherein the press means is a cooperative belt filter press.

6. The apparatus of claim 1 wherein the polishing means is a polishing pond.

METHOD AND APPARATUS FOR REMOVING METAL COMPOUNDS
FROM WASTE MATERIAL

ABSTRACT

5 A method for removing metal compounds from waste water
comprising the steps of adjusting the pH of the water to from 5
to 12 and preferable 6 to 9; aerating the waste water; adding a
flocculating agent to the water and allowing floccules including
metal compounds to form; and separating said floccules including
10 metal compounds from the water. An apparatus for carrying out
this method is also disclosed.

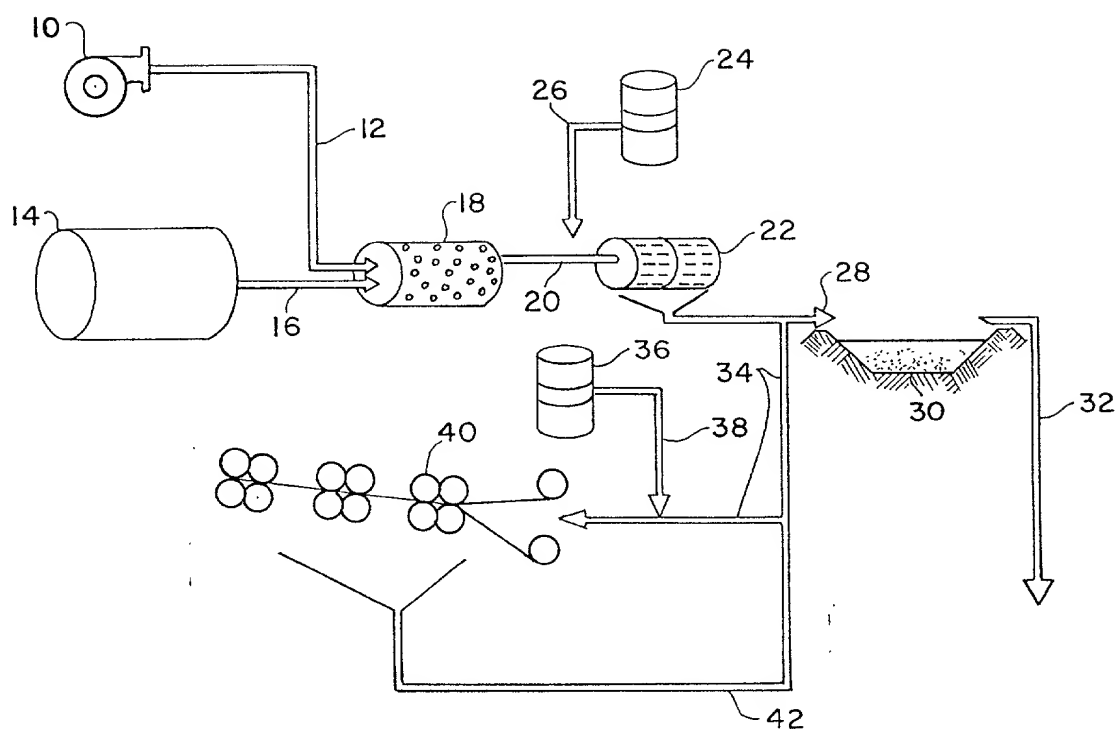


FIG. 1

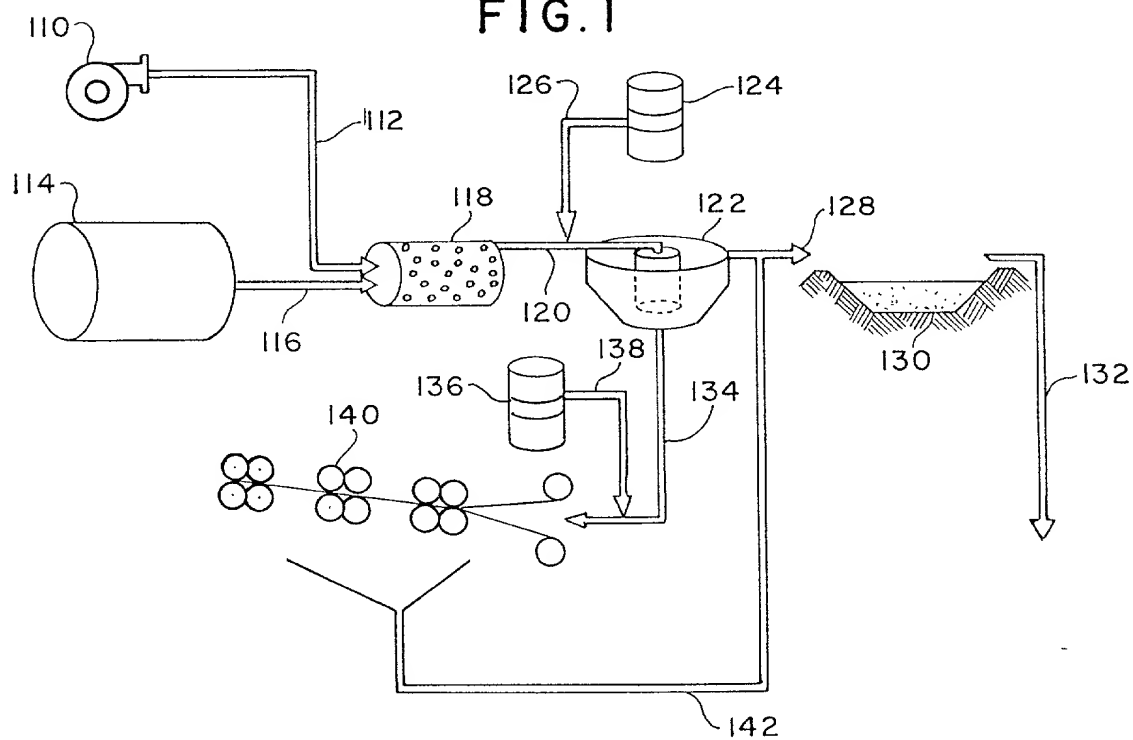


FIG. 2

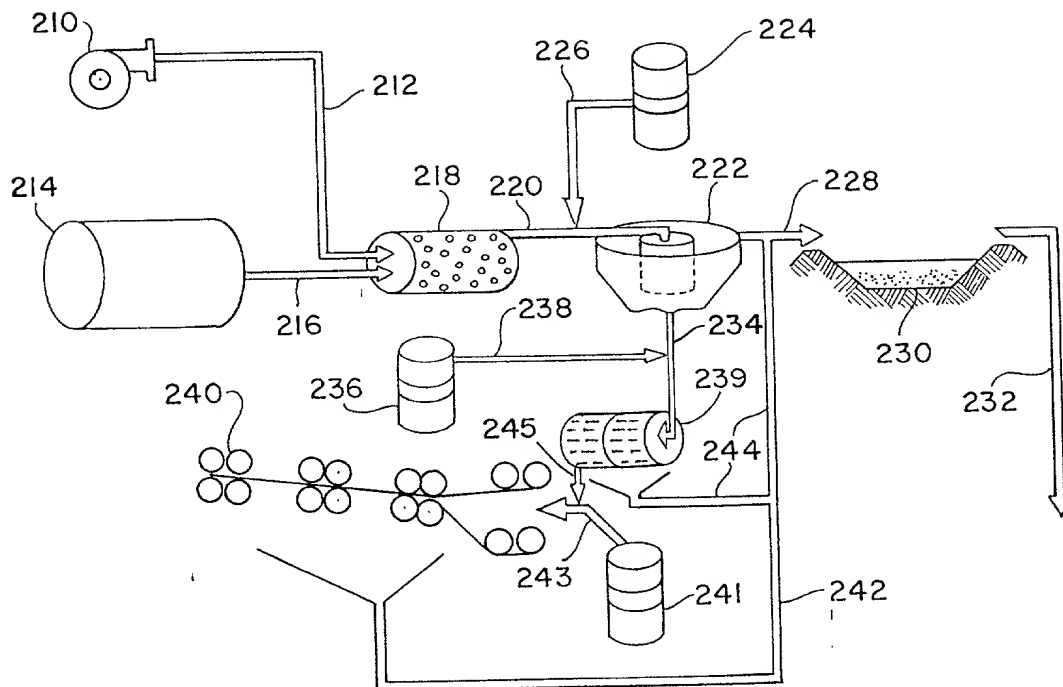


FIG. 3

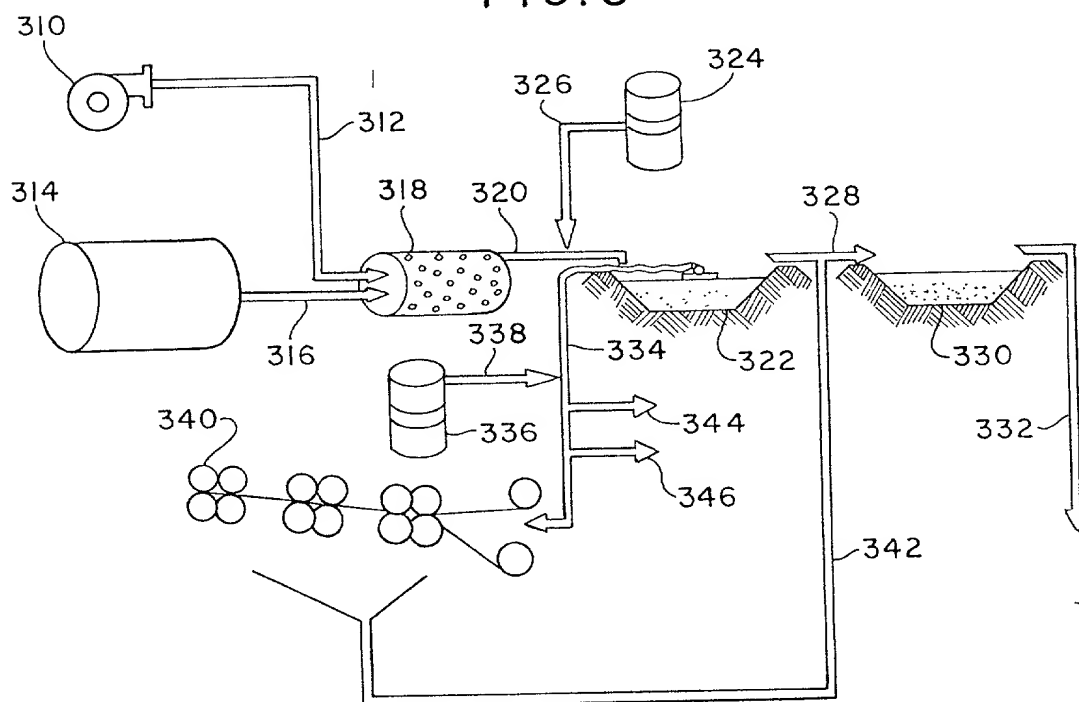


FIG. 4

DECLARATION FOR PATENT APPLICATION

Docket Number 60014-14

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled, METHOD AND APPARATUS FOR REMOVING METAL COMPOUNDS FROM WASTE MATERIAL, the specification of which is attached hereto unless the following box is checked:

☐ was filed on _____ as United States Application Number or PCT International Application _____ Number
and was amended on (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Not Claimed

| | | | |
|-------------------|--------------------|---------------------------------|-------------------------------------|
| _____ (Number) | _____ (Country) | _____ (Day/Month/Year Filed) | <input checked="" type="checkbox"/> |
| _____ (Number) | _____ (Country) | _____ (Day/Month/Year Filed) | <input type="checkbox"/> |

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

| | |
|-------------------------------|------------------------|
| _____ (Application Number) | _____ (Filing Date) |
| _____ (Application Number) | _____ (Filing Date) |

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

| | | |
|-------------------------------|------------------------|---|
| _____ (Application Number) | _____ (Filing Date) | (Status - patented, pending, abandoned) |
| _____ (Application Number) | _____ (Filing Date) | (Status - patented, pending, abandoned) |

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Daniel J. Long Reg. No. 29,404

Address all telephone calls to: Daniel J. Long at telephone number (717) 932-7707

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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